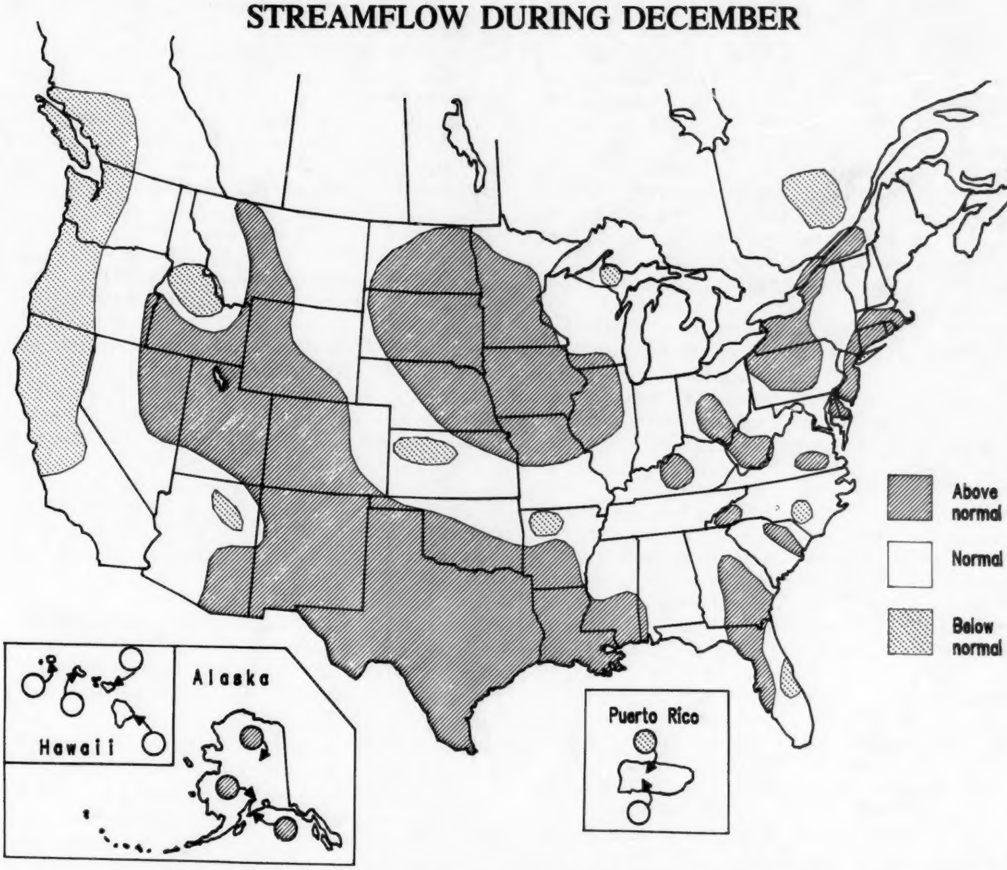
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

DECEMBER 1986

STREAMFLOW DURING DECEMBER



Streamflow was in the normal to above-normal range at 89 percent of the 191 index stations in southern Canada, the United States, and Puerto Rico during December compared to about 90 percent in those ranges for last month.

Calendar year 1986, with 24.5 percent of the index stations in the below-normal range, was less dry overall than calendar year 1985, but the southeastern part of the United States was generally drier in 1986.

Both Lake superior and Lake Erie set new records for highest average annual elevation—602.65 feet and 574.76 feet, respectively, above National Geodetic Vertical Datum of 1929.

Contents of 87 percent of reporting reservoirs were near or above average for the end of December, the same as for the end of November.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,396,800 cubic feet per second (cfs) during December. Flow of the St. Lawrence River at Cornwall, Ontario was a record-breaking 327,000 cfs and was above-normal for the 23rd consecutive month.

Utah's Great Salt Lake rose 0.15 foot during the month, reaching 4,211.20 feet above NGVD on December 31.

SURFACE-WATER CONDITIONS DURING DECEMBER 1986

Streamflow was in the normal to above-normal range at 89 percent of the 191 index stations in southern Canada, the United States, and Puerto Rico during December compared to about 90 percent in those ranges for last month. The map on page 4 shows where streamflow has persisted in the above- or below-normal range from November to December and also where streamflow has moved into the above- or below-normal range for December after being in a different range for November. The table on page 4 shows areal streamflow range conditions and total flow for the 191 index stations reporting data for December.

Streamflow generally increased seasonally in Nevada, Texas, Louisiana, Georgia, the Carolinas, Virginia, Delaware, Maryland, West Virginia, Kentucky, Indiana, Ohio, Pennsylvania, New Jersey, Connecticut, Rhode Island, Massachusetts, and Vermont; contraseasonally in Maine; variably in New Brunswick and Nova Scotia. Flows changed variably in California, Arizona, Idaho, North Dakota, Nebraska, Kansas, Missouri, Arkansas, Ontario, Michigan, Illinois, Alabama, Florida, and New York. Flows remained unchanged in New Hampshire, decreased contraseasonally in Washington, Oregon, Saskatchewan, and Tennessee, and decreased seasonally in the rest of southern Canada, the United States, and Puerto Rico.

New streamflow extremes for December are shown in the table on page 14. Most notable are the new high flows for the St. Lawrence River, Colorado River, and San Juan River, because they are indicators of the prolonged wet spells in the Great Lakes-St. Lawrence River basin (see also hydrographs on pages 7 and 8) and the upper Colorado River basin-Great Basin.

Streamflow for calendar year 1986 is shown by the map on page 3 with the table below summarizing areal range conditions. Calendar year 1986, with 24.5 percent of the index stations in the below-normal range, was less dry overall than calendar year 1985, with 35.9 percent of the index stations in the below-normal range (see map in December 1985 *National Water Conditions*), but the southeastern part of the United States was generally drier in 1986. Most of the Southeast, and parts of Oregon, Washington, Idaho, Montana, Kansas, New York, Connecticut, and New Brunswick were the only areas in the below-normal range for both calendar years. In contrast, much of the upper midcontinent, Great Lakes-St. Lawrence River basin, upper Colorado River basin, and upper Rio Grande basin remained in the above-normal range, continuing the generally wet conditions of the last several years in those areas. The flow of the St. Lawrence River at Cornwall, Ontario, for calendar year 1986 was the highest in 126 years of record, 315,670 cubic feet per second (cfs), about 8,000 cfs greater than the previous high of 1973.

Precipitation during December (see maps on page 5) was generally above average in the Atlantic Coast States, much of the Southwest, and also in several small areas scattered from Michigan to California. Provisional data from the National Weather Service show that precipitation exceeded 6 inches in 22 cities, with record high amounts for the month falling at: Apalachicola (9.67 inches), Key West (11.18 inches), and West Palm Beach (10.10 inches), Florida; Midland (3.25 inches) and San Antonio (7.03 inches), Texas.

Lake levels and streamflow in the Great Lakes-St. Lawrence River basin for the last 26 months are shown by the hydrographs on pages 7 through 9. These hydrographs portray the wide range of surface-water conditions in this large basin of concern to both Canada and the United States. Lake Erie set new highs for both December (574.68 feet above National Geodetic Vertical Datum of 1929) and the average annual elevation for a calendar year (574.76 feet above NGVD of 1929, exceeding the old record of 574.28 feet set in 1973). Lake Superior set a record high annual average of 602.65 feet above NGVD of 1929, exceeding the old record of 602.46 feet for 1951.

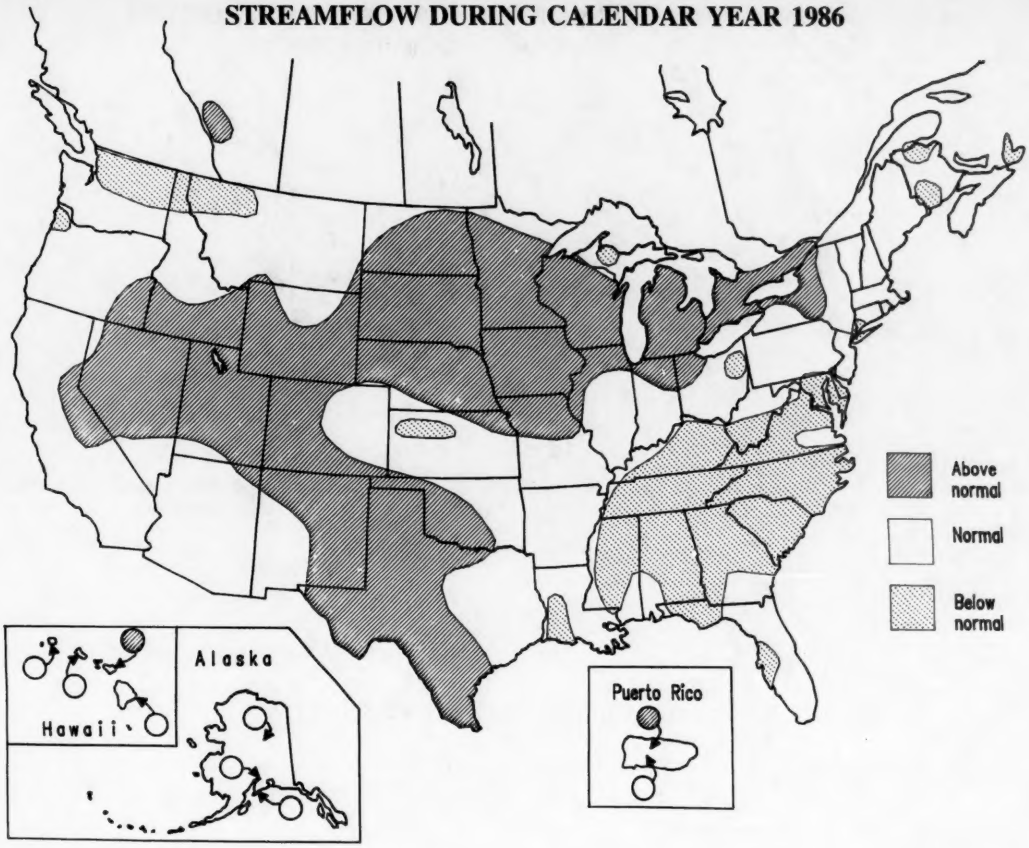
Contents of 87 percent of reporting reservoirs were near or above average for the end of December, the same as for the end of November. Most reporting reservoirs in the Tennessee Valley, Oklahoma, Texas, Colorado, Nevada, Arizona, and New Mexico had contents significantly above average for the end of December. The only reservoirs with both significant declines in contents during the month and significantly below-average contents for the end of the month were Pymatuning reservoir (Pennsylvania), Coeur d'Alene Lake (Idaho), and Lake Cushman (Washington).

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,396,800 cfs during December, 67 percent above median and 13 percent above last month's record-breaking flow, but about 9 percent below last December's record high of 1,527,500 cfs.

Utah's Great Salt Lake rose 0.15 foot during the month, reaching 4,211.20 feet above NGVD on December 31. This level is 0.50 foot above the seasonal low of 4,210.70 feet on September 15, and only 0.65 foot below the maximum of record reached June 3-8, 1986. The seasonal low of 4,210.70 feet was the highest ever recorded.

CONTENTS

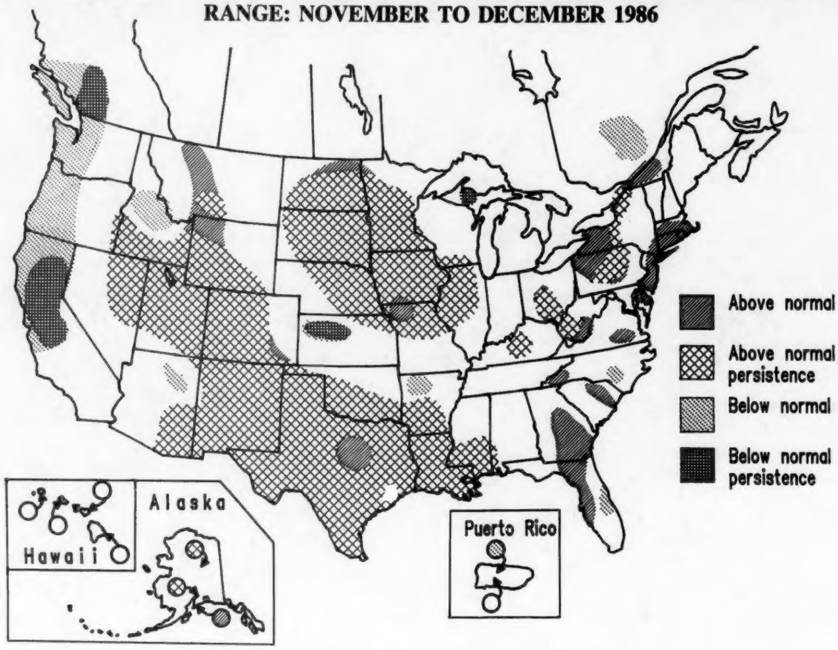
STREAMFLOW DURING CALENDAR YEAR 1986



CALENDAR YEAR 1986 STREAMFLOW RANGE SUMMARY

Area	Below normal range		Normal range		Above normal range		Number of stations	
	No.	Percent	No.	Percent	No.	Percent	Reporting data	Missing data
Conterminous United States.	43	26.2	63	38.4	58	35.4	164	0
Alaska, Hawaii, and Puerto Rico.	0	0	8	80.0	2	20.0	10	0
United States and Puerto Rico.	43	24.7	71	40.8	60	34.5	174	0
Southern Canada........	4	22.2	12	66.7	2	11.1	18	0
Conterminous United States and southern Canada.	47	25.8	75	41.2	60	33.0	182	0
All sites..................	47	24.5	83	43.2	62	32.3	192	0

PERSISTENCE IN, OR MOVEMENT INTO, THE BELOW-NORMAL FLOW RANGE: NOVEMBER TO DECEMBER 1986



SUMMARY OF DECEMBER 1986 STREAMFLOW

[Flow ranges]

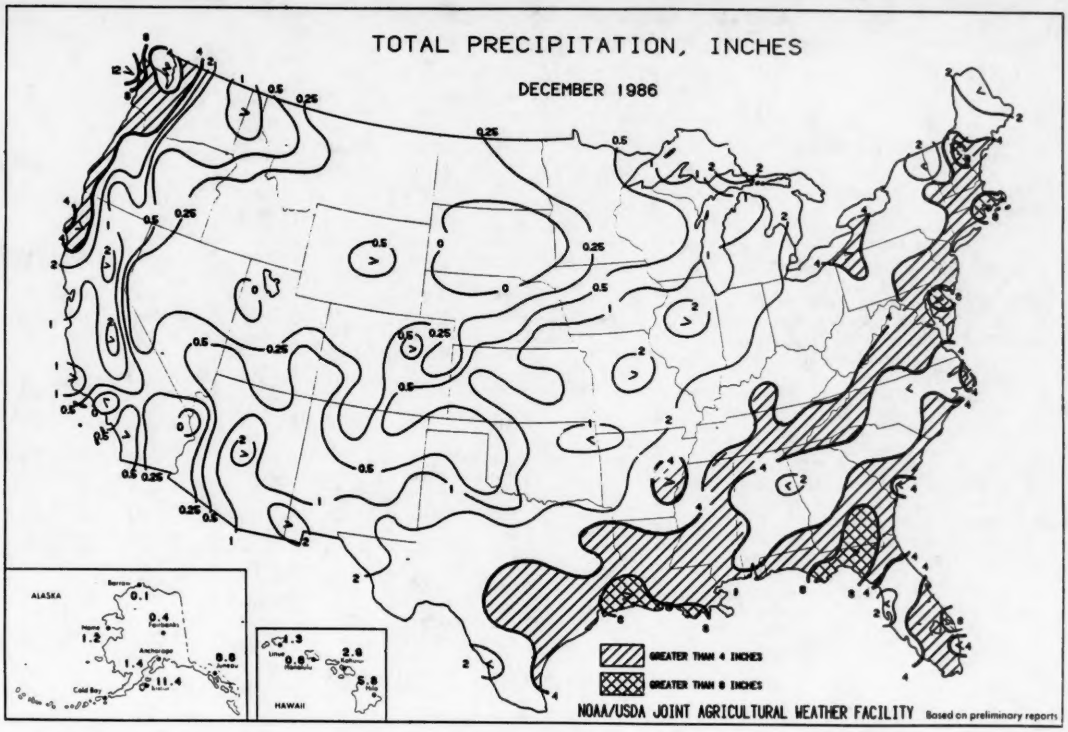
Area	Below normal range		Normal range		Above normal range		Number of stations	
	No.	Percent	No.	Percent	No.	Percent	Reporting data	Missing data
Conterminous United States.	18	11.0	64	39.3	81	49.7	163	*1
Alaska, Hawaii, and Puerto Rico.	1	10.0	5	50.0	4	40.0	10	0
United States and Puerto Rico.	19	11.0	69	39.9	85	49.1	173	*1
Southern Canada........	2	11.1	15	83.3	1	5.6	18	0
Conterminous United States and southern Canada.	20	11.1	79	43.6	82	45.3	181	*1
All sites..................	21	11.0	84	44.0	86	45.0	191	*1

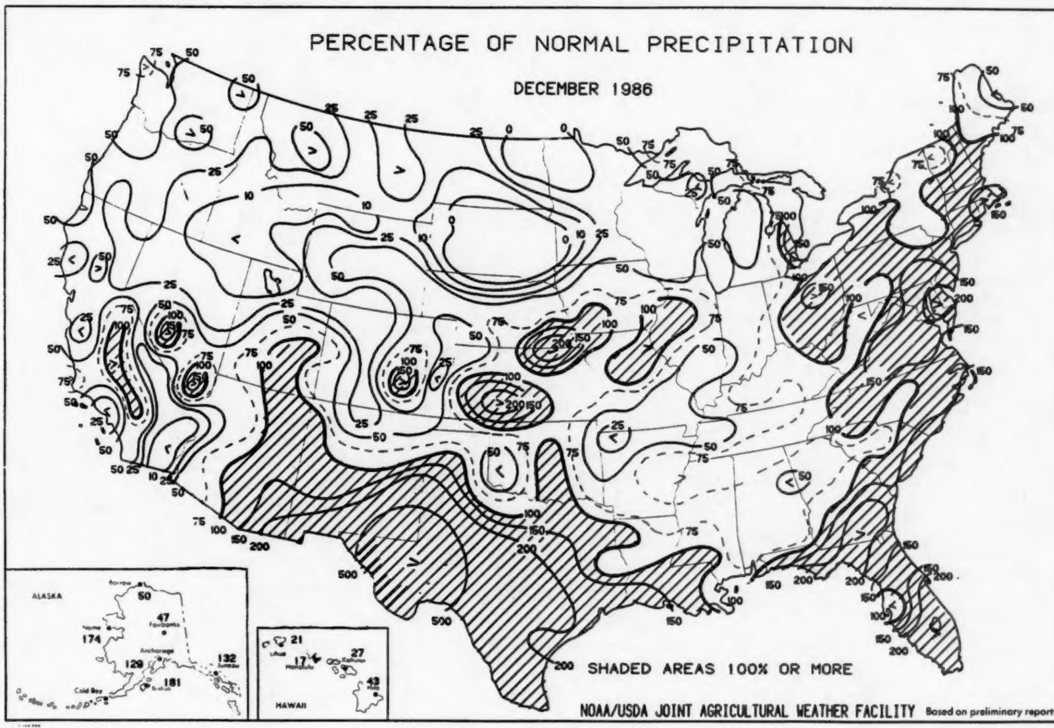
*John Day River at Service Creek, Oregon.

[Comparison of total monthly means with total monthly medians and last month's total monthly means]

Total of December means (191 sites)..	2,586,280 CFS
Total of December medians (191 sites)..	1,618,600 CFS
Total of last month's means (191 sites)..	*2,299,370 CFS
Total of December means compared to total of medians..	+60 Percent
Total of December means compared to total of last month's means........................	+12 Percent

*Revised.


TOTAL PRECIPITATION, INCHES
DECEMBER 1986
GREATER THAN 4 INCHES
GREATER THAN 8 INCHES
ALASKA
HAWAII
NOAA/USDA JOINT AGRICULTURAL WEATHER FACILITY
Based on preliminary reports

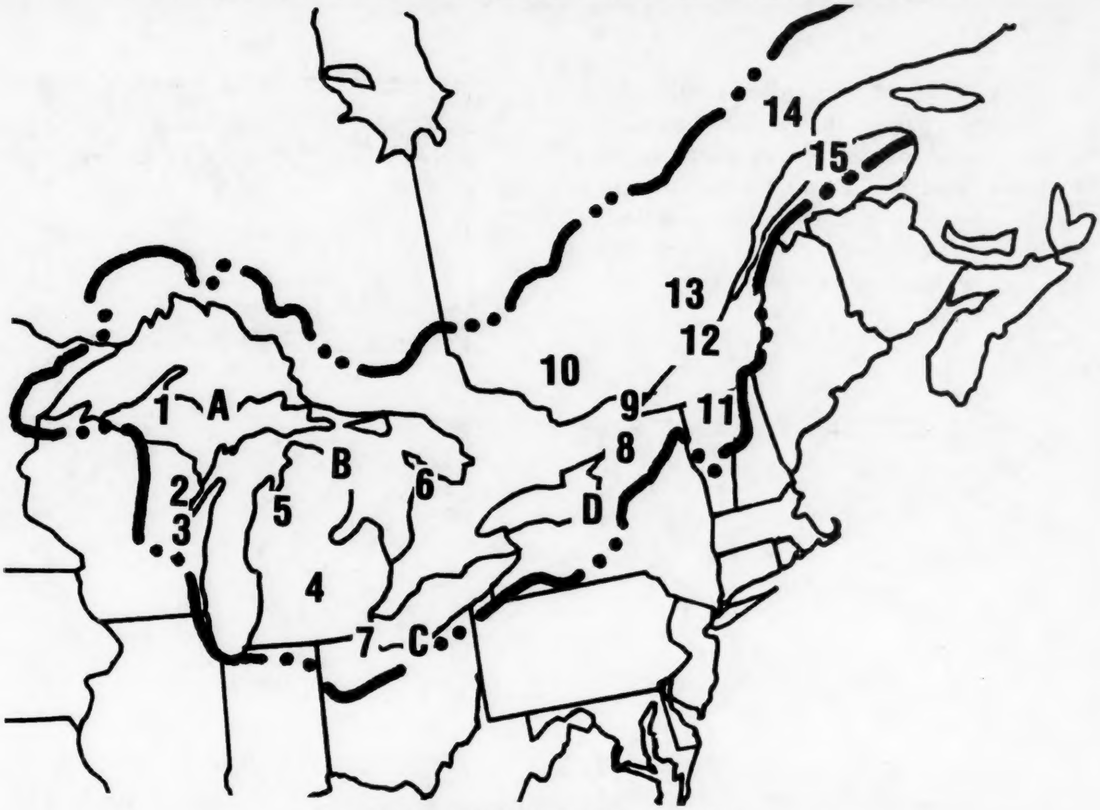

PERCENTAGE OF NORMAL PRECIPITATION
DECEMBER 1986
SHADED AREAS 100% OR MORE
ALASKA
HAWAII
NOAA/USDA JOINT AGRICULTURAL WEATHER FACILITY
Based on preliminary reports

FLOW OF LARGE RIVERS DURING DECEMBER 1986

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1980 (cubic feet per second)	December 1986					
				Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge, 1951—80	Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	3,980	81	−28	3,000	1,900	31
01318500	Hudson River at Hadley, N.Y.	1,664	2,909	2,930	118	+17	2,290	1,480	31
01357500	Mohawk River at Cohoes, N.Y.	3,456	5,734	7,610	146	−18	5,000	3,200	31
01463500	Delaware River at Trenton, N.J.	6,780	11,750	17,260	148	+27	15,300	9,890	31
01570500	Susquehanna River at Harrisburg, Pa.	24,100	34,530	53,200	156	+13	59,900	38,710	28
01646500	Potomac River near Washington, D.C.	11,560	[1]11,490	[1]13,100	131	+197	16,100	10,410	31
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	5,005	2,066	53	+54	2,270	1,467	31
02131000	Pee Dee River at Peedee, S.C.	8,830	9,851	9,740	130	+105	12,000	7,800	28
02226000	Altamaha River at Doctortown, Ga.	13,600	13,880	20,470	258	+387	20,500	13,250	28
02320500	Suwannee River at Branford, Fl.	7,880	6,987	5,470	171	+101	7,600	4,910	31
02358000	Apalachicola River at Chattahoochee, Fl.	17,200	22,570	20,400	120	+154	17,800	11,500	31
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	23,300	34,470	169	+34	21,400	13,830	31
02489500	Pearl River near Bogalusa, La.	6,630	9,768	22,650	413	+188	14,300	9,240	31
03049500	Allegheny River at Natrona, Pa.	11,410	[1]19,480	[1]38,660	147	+100	3,300	2,130	29
03085000	Monongahela River at Braddock, Pa.	7,337	[1]12,510	[1]18,970	128	− 28	10,800	6,980	23
03193000	Kanawha River at Kanawha Falls, W.Va.	8,367	12,590	19,250	140	+56	28,600	18,480	28
03234500	Scioto River at Higby, Ohio	5,131	4,547	9,229	228	+112	3,310	2,139	31
03294500	Ohio River at Louisville, Ky.[2]	91,170	116,00	235,600	182	+75	253,700	164,000	29
03377500	Wabash River at Mount Carmel, Ill.	28,635	27,220	23,070	101	+91	15,900	10,280	31
03469000	French Broad River below Douglas Dam, TN.	4,543	6,798	7,784	119	+75	...	...	..
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,163	3,895	108	−31	3,964	2,562	28
04264331	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	298,800	242,700	327,000	137	−3	360,000	233,000	31
02NG001	St. Maurice River at Grand Mere, P.Q.	16,300	25,150	7,230	54	−57	23,600	15,250	30
05082500	Red River of the North at Grand Forks, N.Dak.	30,100	2,551	2,023	176	+1	1,890	1,221	17
05133500	Rainy River at Manitou Rapids, Minn.	19,400	11,830	9,800	100	−2	8,200	5,300	29
05330000	Minnesota River near Jordan, Minn.	16,200	3,402	4,782	733	−27	4,650	3,005	29
05331000	Mississippi River at St. Paul, Minn.	36,800	[1]10,610	14,720	303	−21	14,600	9,440	29
05365500	Chippewa River at Chippewa Falls, Wis.	5,600	5,100	3,840	122	−20	3,450	2,229	28
05407000	Wisconsin River at Muscoda, Wis.	10,300	8,617	8,213	127	−12	...	...	..
05446500	Rock River near Joslin, Ill.	9,551	5,873	7,330	156	−18	5,700	3,680	31
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	67,820	186	−28	68,100	44,010	31
06214500	Yellowstone River at Billings, Mont.	11,796	7,038	3,370	111	−26	2,990	1,932	31
06934500	Missouri River at Hermann, Mo.	524,200	79,490	133,600	330	−9	85,000	54,900	31
07289000	Mississippi River at Vicksburg, Miss.[4]	1,140,500	576,600	995,400	201	+24	1,073,000	693,500	22
07331000	Washita River near Dickson, Okla.	7,202	1,368	3,150	877	−34	2,600	1,680	31
08276500	Rio Grande below Taos Junction Bridge, near Taos, N.Mex.	9,730	725	931	218	−30	737	476	31
09315000	Green River at Green River, Utah	44,850	6,298	5,797	242	−10	...	...	..
11425500	Sacramento River at Verona, Calif.	21,257	18,820	10,700	52	+4	10,200	6,590	29
13269000	Snake River at Weiser, Idaho	69,200	18,050	22,700	146	+7	21,600	13,960	31
13317000	Salmon River at White Bird, Idaho	13,550	11,250	4,050	87	−23	3,540	2,287	31
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	9,490	149	+27	4,430	2,863	31
14105700	Columbia River at The Dalles, Oreg.[5]	237,000	[1]193,100	[1]74,400	85	−20	152,200	98,370	29
14191000	Willamette River at Salem, Oreg.	7,280	[1]23,510	[1]23,400	54	−38	23,100	14,930	29
15515500	Tanana River at Nenana, Alaska	25,600	23,460	8,794	130	−14	8,600	5,560	31
08MF005	Fraser River at Hope, B.C.	83,800	96,290	32,170	73	−30	35,660	23,050	30

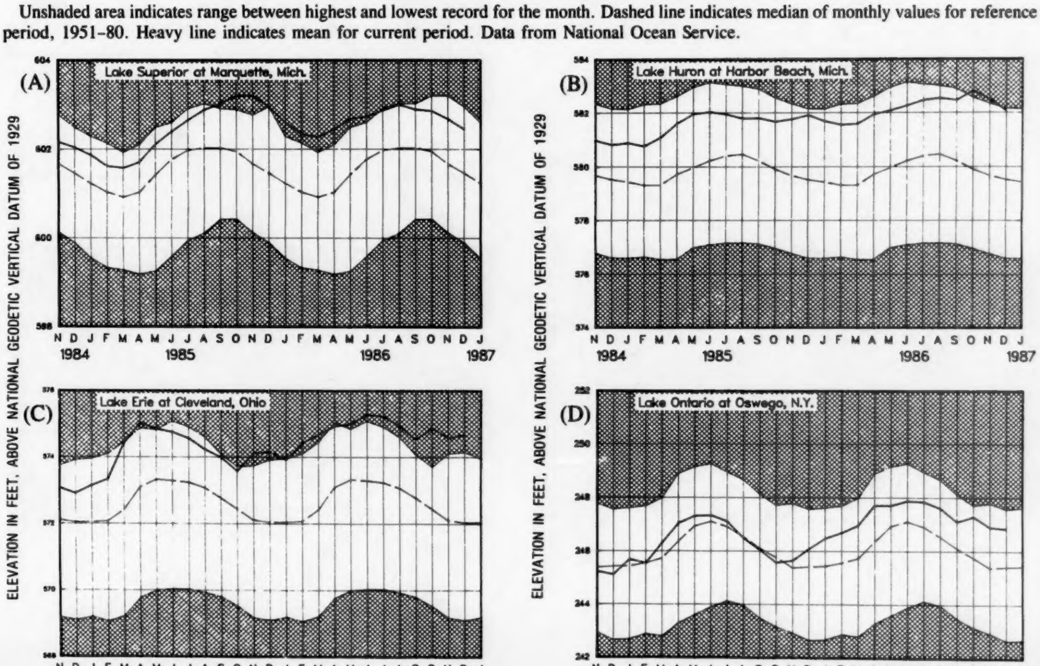
[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

LOCATION OF SITES FOR WHICH HYDROGRAPHS ARE SHOWN



GREAT LAKES ELEVATIONS

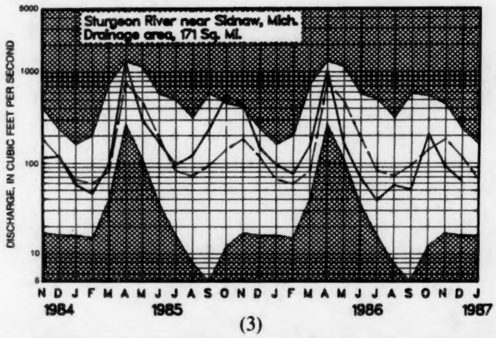
Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951–80. Heavy line indicates mean for current period. Data from National Ocean Service.



HYDROGRAPHS FOR STREAMFLOW INDEX STATIONS IN THE GREAT LAKES-ST. LAWRENCE RIVER BASIN

The 15 streamflow hydrographs shown on these two pages represent all sites in the Great Lakes-St. Lawrence River basin reporting data for the *National Water Conditions*. Drainage areas for these sites range from 171 square miles (Sturgeon River near Sidnaw, Michigan) to 298,800 square miles (St. Lawrence River at Cornwall, Ontario).

(1)



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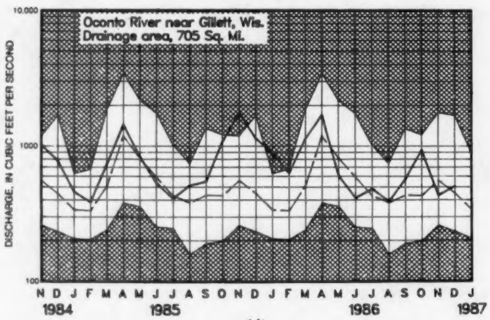

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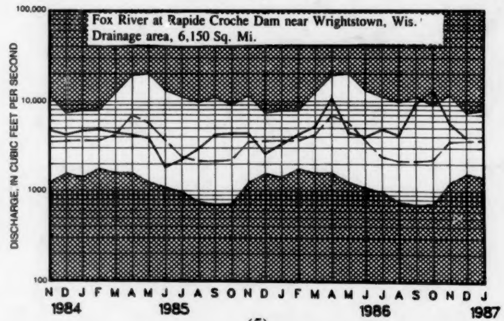

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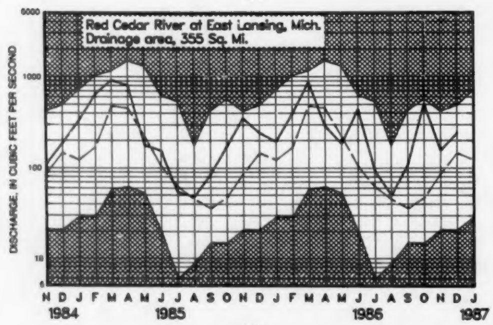

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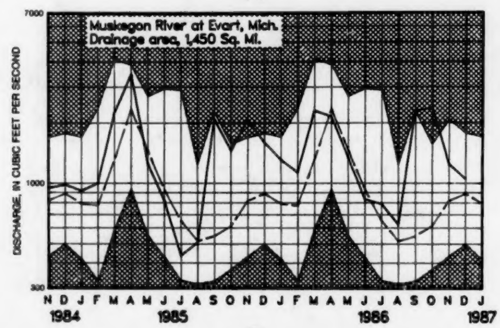

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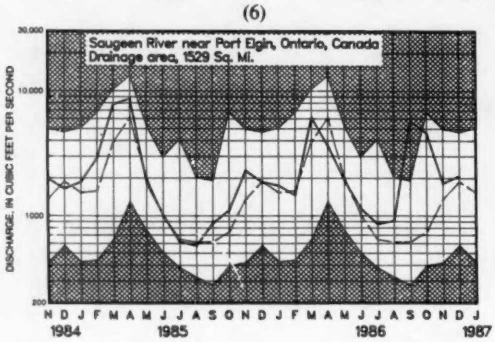

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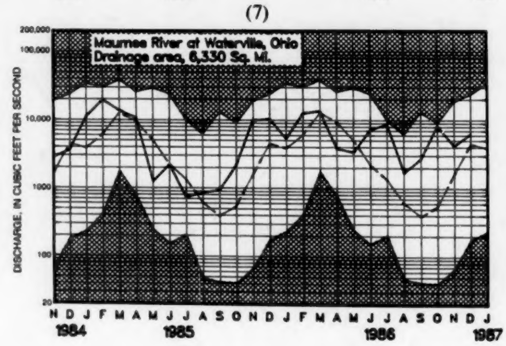

HYDROGRAPHS FOR STREAMFLOW INDEX STATIONS IN THE GREAT LAKES-ST. LAWRENCE RIVER BASIN-Continued

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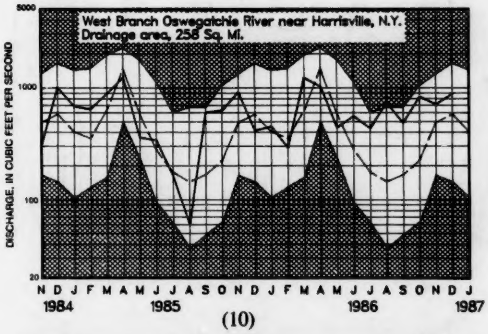

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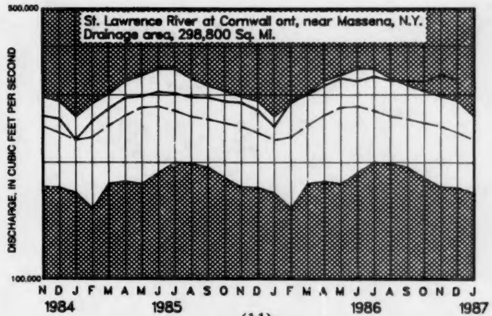

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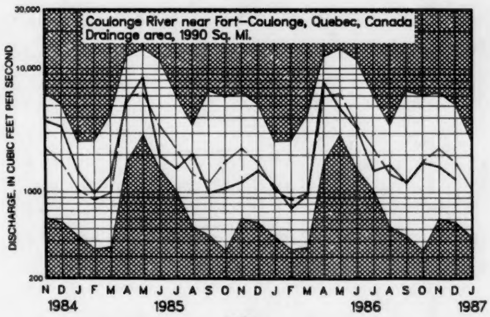

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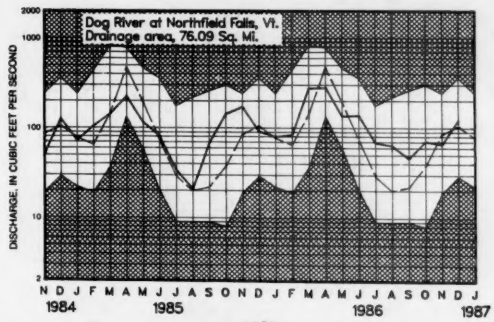

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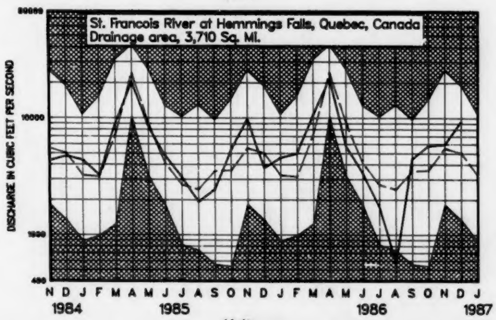

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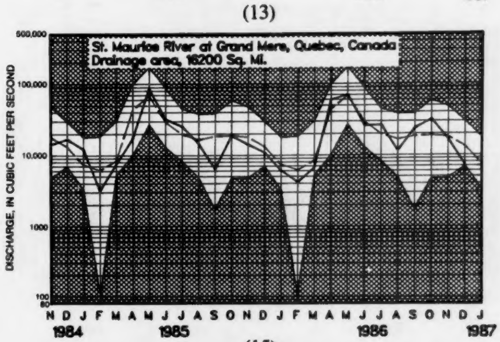

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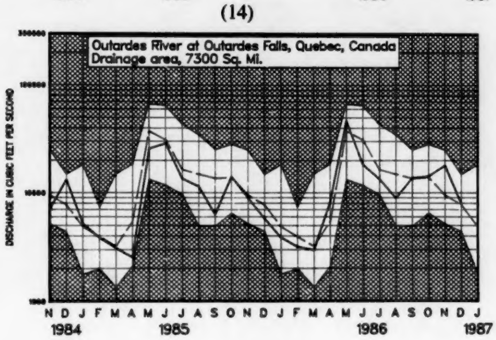

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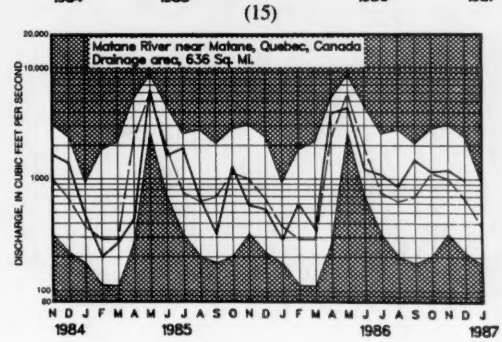
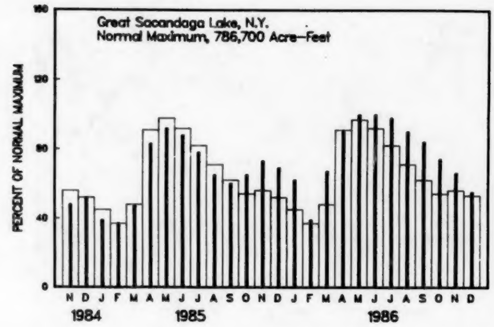
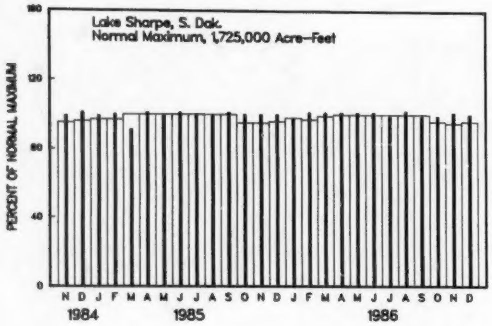
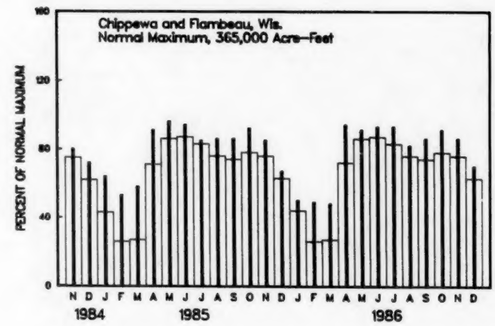
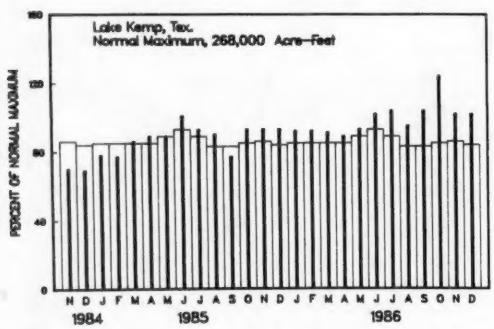


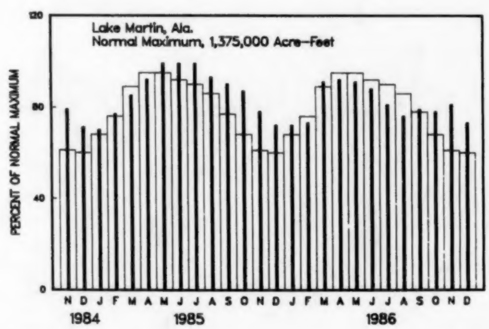
USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS

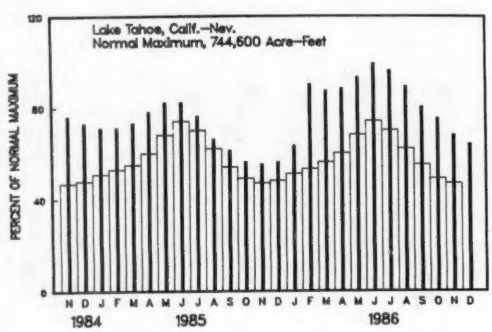


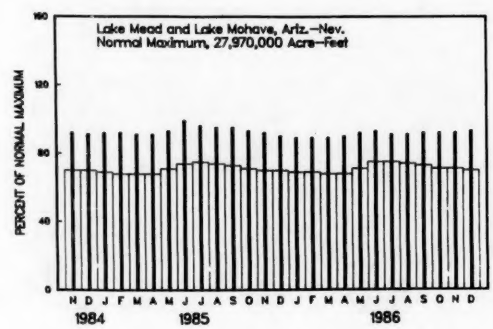












Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF DECEMBER 1986

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum				Normal maximum[a] (acre-feet)
	End of Dec. 1986	End of Dec. 1985	Average for end of Dec.	End of Nov. 1986	
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs(P)	42	21	50	36	[b]226,300
QUEBEC					
Allard (P)	83	78	58	82	280,600
Gouin (P)	89	77	66	94	6,954,000
MAINE					
Seven reservoir systems (MP)	55	50	57	55	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	57	35	58	66	76,450
Lake Francis (FPR)	75	61	70	78	99,310
Lake Winnipesaukee (PR)	75	60	62	68	165,700
VERMONT					
Harriman (P)	68	63	60	81	116,200
Somerset (P)	85	73	67	88	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	78	78	72	70	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	55	69	53	66	786,700
Indian Lake (FMP)	76	81	62	69	103,300
New York City reservoir system (MW)	89	74	82	84	1,680,000
NEW JERSEY					
Wanaque (M)	93	99	71	68	85,100
PENNSYLVANIA					
Allegheny (FPR)	32	32	34	35	1,180,000
Pymatuning (FMR)	73	107	82	80	188,000
Raystown Lake (FR)	68	68	55	67	761,900
Lake Wallenpaupack (PR)	75	70	57	69	157,800
MARYLAND					
Baltimore municipal system (M)	66	72	84	60	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	95	92	77	95	288,800
Narrows (Badin Lake) (P)	85	82	93	84	128,900
High Rock Lake (P)	79	32	60	55	234,800
SOUTH CAROLINA					
Lake Murray (P)	85	82	61	85	1,614,000
Lakes Marion and Moultrie (P)	59	67	61	83	1,862,000
SOUTH CAROLINA—GEORGIA					
Clark Hill (FP)	52	73	53	35	1,730,000
GEORGIA					
Burton (PR)	89	83	52	97	104,000
Sinclair (MPR)	88	88	75	91	214,000
Lake Sidney Lanier (FMPR)	42	52	51	38	1,686,000
ALABAMA					
Lake Martin (P)	73	72	60	81	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	41	21	31	33	2,293,000
Douglas Lake (FPR)	16	12	11	26	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	53	50	38	57	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	46	41	32	43	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	48	35	38	44	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	70	67	63	86	365,000
Wisconsin River (21 reservoirs) (PR)	65	78	55	80	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	31	25	23	34	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	90	77	84	91	22,700,000
SOUTH DAKOTA					
Angostura (I)	88	49	72	90	127,600
Belle Fourche (I)	63	23	44	57	185,200
Lake Francis Case (FIP)	54	58	56	50	4,834,000
Lake Oahe (FIP)	82	73	. . .	86	22,530,000
Lake Sharpe (FIP)	100	100	96	101	1,725,000
Lewis and Clark Lake (FIP)	91	93	91	85	432,000

Reservoir Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum				Normal maximum[a] (acre-feet)
	End of Dec. 1986	End of Dec. 1985	Average for end of Dec.	End of Nov. 1986	
NEBRASKA					
Lake McConaughy (IP)	81	80	71	80	1,948,000
OKLAHOMA					
Eufaula (FRP)	103	104	85	104	2,378,000
Keystone (FPR)	103	102	92	97	661,000
Tenkiller Ferry (FPR)	106	115	93	113	628,200
Lake Altus (FIMR)	100	20	46	100	133,000
Lake O'The Cherokees (FPR)	96	102	80	96	1,492,000
OKLAHOMA—TEXAS					
Lake Texoma (FMPRW)	99	92	90	102	2,722,000
TEXAS					
Bridgeport (IMW)	92	79	46	92	386,400
Canyon (FMR)	112	100	77	97	385,600
International Amistad (FIMPW)	82	84	84	82	3,497,000
International Falcon (FIMPW)	63	40	76	54	2,668,000
Livingston (IMW)	104	105	87	104	1,788,000
Possum Kingdom (IMPRW)	96	91	97	95	570,200
Red Bluff (PI)	77	23	28	69	307,000
Toledo Bend (P)	95	99	83	85	4,472,000
Twin Buttes (FIM)	45	12	30	43	177,800
Lake Kemp (IMW)	102	93	84	102	268,000
Lake Meredith (FWM)	29	31	37	29	796,900
Lake Travis (FIMPRW)	110	95	78	100	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	82	76	85	87	2,043,000
Fort Peck (FPR)	85	74	84	85	18,910,000
Hungry Horse (FIPR)	76	74	76	80	3,451,000
WASHINGTON					
Ross (PR)	76	68	69	88	1,052,000
Franklin D. Roosevelt Lake (IP)	94	63	94	99	5,022,000
Lake Chelan (PR)	54	57	55	71	676,100
Lake Cushman (PR)	46	40	82	55	359,500
Lake Merwin (P)	100	103	96	99	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	54	54	58	53	1,235,000
Coeur d'Alene Lake (P)	35	17	55	67	238,500
Pend Oreille Lake (FP)	35	43	49	35	1,561,000
IDAHO—WYOMING					
Upper Snake River (8 reservoirs) (MP)	56	36	61	59	4,401,000
WYOMING					
Boysen (FIP)	82	76	75	87	802,000
Buffalo Bill (IP)	64	65	68	65	421,300
Keyhole (F)	34	29	42	34	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	68	60	48	67	3,056,000
COLORADO					
John Martin (FIR)	79	85	16	71	364,400
Taylor Park (IR)	72	65	54	71	106,200
Colorado-Big Thompson project (I)	82	74	57	82	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	88	89	. . .	91	31,620,000
UTAH—IDAHO					
Bear Lake (IPR)	75	76	58	79	1,421,000
CALIFORNIA					
Folsom (FIP)	48	58	54	51	1,000,000
Hetch Hetchy (MP)	42	51	37	51	360,400
Isabella (FIR)	43	34	26	43	568,100
Pine Flat (FI)	58	36	47	56	1,001,000
Clair Engle Lake (Lewiston) (P)	73	61	73	73	2,438,000
Lake Almanor (P)	69	63	50	69	1,036,000
Lake Berryessa (FIMW)	83	75	79	84	1,600,000
Millerton Lake (FI)	31	64	54	29	503,200
Shasta Lake (FIPR)	68	55	68	70	4,377,000
CALIFORNIA—NEVADA					
Lake Tahoe (IPR)	64	56	48	68	744,600
NEVADA					
Rye Patch (I)	69	60	56	65	194,300
ARIZONA—NEVADA					
Lake Mead and Lake Mohave (FIMP)	93	90	70	92	27,970,000
ARIZONA					
San Carlos (IP)	77	89	22	71	935,100
Salt and Verde River system (IMPR)	84	83	41	81	2,019,100
NEW MEXICO					
Conchas (FIR)	96	86	78	93	330,100
Elephant Butte and Caballo (FIPR)	96	88	31	96	2,442,000

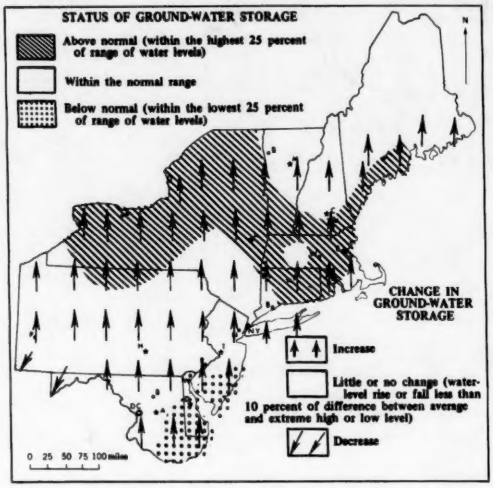
[a] 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b] Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

GROUND-WATER CONDITIONS DURING DECEMBER 1986

Ground-water levels continued to rise in most of the Northeast region other than in central and northern Maine where levels changed only slightly. (See map.) Above-average levels persisted in northern New York State, and levels became above average in western New York and in several parts of central and southern New England. Levels near the end of the month in two key observation wells in Rhode Island were the highest for December in 40 years of measurement at those sites. A 33-year high for December was recorded in a key well in Southeastern New Hampshire. Contrasting with these high levels, ground-water levels remained below average in southern New Jersey, most of Delaware, and eastern Maryland.

In the Southeastern States, ground-water levels rose in Virginia and Mississippi. Trends were mixed in other States. Water levels were above average in Kentucky, and below average in Arkansas, Louisiana, and in most of Florida. Levels were mixed with respect to average in other States. A new low ground-water level for December was recorded in the key well at Memphis, Tennessee. New low levels for December also were reported in wells in Alabama and in the Savannah area in the coastal plain of Georgia. The new December low levels in Tennessee and Georgia were established despite contrary net trends during the month.

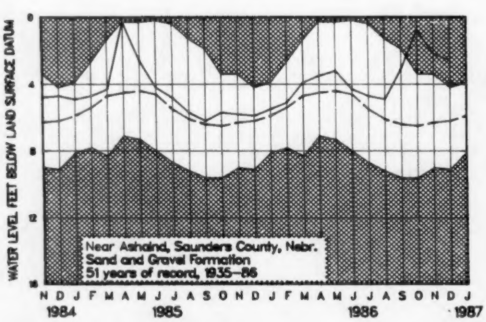
In the central and western Great Lakes States, ground-water levels showed mixed trends in Michigan, Ohio, and Iowa, and declined in Minnesota, Wisconsin, and Indiana.

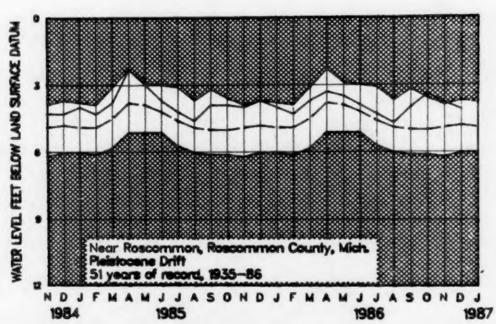


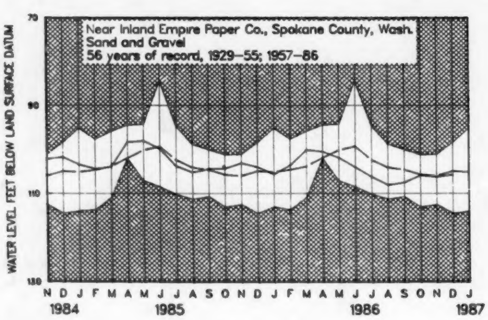
Map showing ground-water storage near end of December and change in ground-water storage from end of Novemeber to end of December.

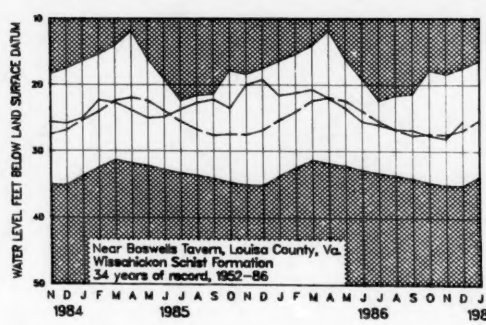
MONTH-END GROUND-WATER LEVELS IN KEY WELLS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.









Water levels were in the normal range in Indiana, above average in Minnesota and Iowa, and mostly above average in Wisconsin.

In the Western States, ground-water levels rose in Washington, Nevada, Arizona, and New Mexico, declined in North Dakota, and declined or held steady in wells in the Snake River Plain aquifer in Idaho. Trends were mixed in other Western States. Water levels were average or above average in North Dakota, above average in Nebraska, and below average in Arizona. Levels were mixed with respect to average in other States. New high ground-water levels for December were recorded in key wells in North Dakota, Nebraska, and Nevada. New December low levels were recorded in wells in Nevada, Kansas, New Mexico, and Texas. The level in the Berrendo-Smith observation well in the Roswell artesian basin in New Mexico rose to an alltime high level in 20 years of record for the second consecutive month. The new month-end high levels for December in North Dakota and Nebraska were established despite contrary net trends during the month. Likewise, the new December lows in Nevada, Kansas, and New Mexico were established also despite contrary trends.

Provisional data; subject to revision

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—DECEMBER 1986

Aquifer and Location	Water level in feet with reference to land-surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
			Last month	Last year		
Glacial drift at Hanska, south-central Minnesota.	−5.70	+2.68	−0.44	+0.42	1942	
Glacial drift at Roscommon in north-central part of Lower Peninsula, Michigan.	−4.15	+0.68	−0.28	−0.45	1935	
Glacial drift at Marion, Iowa	−3.19	+3.12	+0.13	+0.95	1941	
Glacial drift at Princeton in northwestern Illinois.	−6.80	+7.11	+1.20	−0.42	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia.	−16.67	−0.75	+0.16	−3.17	1939	
Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2).	−18.23	+7.14	−0.08	−1.94	1946	
500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2).	−105.45	+15.95	+0.08	−0.95	1941	Dec. low.
Granite in eastern Piedmont Province, Chapel Hill, North Carolina (U.S. well no. 5).	−45.97	−2.47	−0.26	−3.87	1931	
Sparta Sand in Pine Bluff industrial area, Arkansas.	−227.90	−21.49	−3.95	−7.40	1958	
Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4).	−26.5	−4.9	−1.4	−3.3	1952	Dec. low
Limestone aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6).	−33.60	−6.89	+2.25	−2.00	1956	
Sand and gravel in Puget Trough, Tacoma, Washington.	−102.02	+7.83	+0.44	−0.06	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3).	−464.0	−2.6	−0.9	−3.4	1929	
Snake River Group: Snake River Plain Aquifer, at Eden, Idaho (U.S. well no. 4).	−119.3	−1.8	−0.9	+2.5	1957	
Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9).	−6.48	+20.55	+0.02	−2.21	1929	
Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6).	−2.60	+3.59	−0.40	+3.30	1935	Dec. high.
Alluvial valley fill in Steptoe Valley, Nevada	−7.38	+5.49	+0.32	+0.40	1950	Dec. high.
Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas.	−16.46	+4.37	−1.36	−0.02	1953	
Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California	−116.43	+27.72	+0.87	+8.88	1957	
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15).	−103.3	−23.1	+0.2	+1.5	1951	
Hueco bolson, El Paso area, Texas	−266.32	−19.45	−0.17	−1.26	1965	Dec. low.
Evangeline aquifer, Houston area, Texas	−312.56	−10.61	+3.04	+1.14	1965	

NEW EXTREMES DURING DECEMBER 1986 AT STREAMFLOW INDEX STATIONS

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous December extremes (period of record): Monthly mean in cfs (year)	Previous December extremes (period of record): Daily mean in cfs (year)	December 1986: Monthly mean in cfs	December 1986: Percent of median	December 1986: Daily mean in cfs	December 1986: Day
	LOW FLOWS								
09402000	Little Colorado River near Cameron, Ariz.	26,500	39	0 (*)	0 (*)	0	0	0	(*)
	HIGH FLOWS								
01117500	Pawcatuck River at Wood River Junction, R.I.	100	46	511 (1972)	701 (1969)	544	282	903	5
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, N.Y.	298,800	126	288,500 (1979)	305,000 (1979)	327,000	137	360,000	31
06441500	Bad River near Fort Pierre, S. Dak.	3,107	58	3.13 (1942)	6.0 (1977)	14.4	72,000	33	2
06630000	North Platte River above Seminoe Reservoir near Sinclair, Wyo.	4,175	47	620 (1984)	700 (1971)	709	212	730	1
06800500	Elkhorn River at Waterloo, Nebr.	6,900	66	1,470 (1982)	3,000 (1982)	1,667	316	2,190	3
08167500	Guadalupe River near Spring Branch, Tex.	1,315	64	829 (1923)	4,730 (1940)	1,300	743	5,100	23
09180500	Colorado River near Cisco, Utah	24,100	75	5,944 (1985)	7,900 (1985)	6,718	215	7,620	8
09379500	San Juan River near Bluff, Utah	23,000	72	3,821 (1965)	5,340 (1965)	3,986	506	5,140	7
15514000	Chena River at Fairbanks, Alaska	1,980	38	714 (1971)	920 (1971)	778	185	800	1

* Occurred more than once.

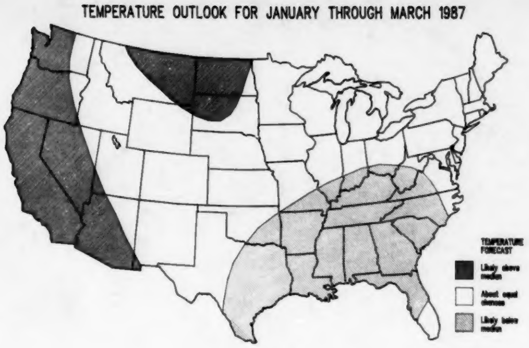
Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR DECEMBER 1986, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	December data of following calendar years	Stream discharge during month: Mean (cfs)	Dissolved-solids concentration[a]: Minimum (mg/L)	Dissolved-solids concentration[a]: Maximum (mg/L)	Dissolved-solids discharge[a] (tons per day): Mean	Dissolved-solids discharge[a] (tons per day): Minimum	Dissolved-solids discharge[a] (tons per day): Maximum	Water temperature[b]: Mean in °C	Water temperature[b]: Minimum, in °C	Water temperature[b]: Maximum, in °C
01463500	Delaware River at Trenton, NJ (Morrisville, PA).	1986	17,260	74	96	4,130	2,820	5,800	4.0	2.0	6.5
		1944—85	13,110	62	138	....	631	20,500	...	0.0	12.0
		(Extreme yr)		(1983)	(1980)		(1964)	(1973)			
			[c]11,650								
07289000	Mississippi River at Vicksburg, MS.	1986	995,400	205	247	605,600	471,700	681,000	7.5	5.5	10.0
		1975—85	729,300	153	295	402,600	131,000	712,800	7.5	0.0	13.0
		(Extreme yr)		(1978)	(1980)		(1976)	(1985)			
			[c]495,500								
03612500	Ohio River at lock and dam 53, near Grand Chain, IL (streamflow station at Metropolis, IL).	1986	487,000	160	181	....	177,000	299,000	...	7.0	11.0
		1954—85	329,000	138	362	....	21,300	469,000	...	0.0	14.0
		(Extreme yr)		(1962)	(1969)		(1980)	(1977)			
			[c]286,000								
06934500	Missouri River at Hermann, MO (60 miles west of St. Louis, MO).	1986	133,000	316	445	130,000	86,000	181,000	4.0	3.5	5.5
		1975—85	74,770	222	770	74,270	34,600	237,000	3.5	0.0	14.0
		(Extreme yr)		(1982)	(1978)		(1980)	(1982)			
			[c]40,520								
14128910	Columbia River at Warrendale, OR (streamflow station at The Dalles, OR).	1986	148,000	107	123	46,800	35,700	56,600	6.5	5.5	9.0
		1975—85	158,500	82	128	45,800	22,800	77,300	6.5	0.5	10.5
		(Extreme yr)		(1975)	(1984)		(1978)	(1980)			
			[c]87,495								

[a]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951—80, for comparison with data for current month.

TEMPERATURE OUTLOOK FOR JANUARY THROUGH MARCH 1987



PRECIPITATION OUTLOOK FOR JANUARY THROUGH MARCH 1987

NATIONAL WATER CONDITIONS

DECEMBER 1986

Based on reports from the Canadian and U.S. Field offices; completed January 29, 1987

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EXPLANATION OF DATA (Revised August 1986)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 184 index gaging stations—18 in Canada, 164 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, one New York index station, and the Puerto Rico index stations because of the limited records available.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest 25 percent of flows and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range) 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as; *above normal* if it is greater than the upper quartile, *in the normal range* if it is between the upper and lower quartiles, and *below normal* if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as *seasonal* if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as *contraseasonal* (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. *Probability of occurrence* is the chance that a given flood magnitude will be exceeded in any one year. *Recurrence interval* is the reciprocal of probability of occurrence and is the *average* number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. *Recurrence intervals imply no regularity of occurrence;* a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about *ground-water levels* refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the 30-year reference period, 1951-80, or from the entire past record for that well when only limited records are available. Comparative data for ground-water levels are obtained in the same manner as comparative data for streamflow. *Changes in ground-water levels,* unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data for December are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). *Dissolved solids* are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. *Dissloved-solids discharge* represents the total daily amount of dissolved minerals carried by the stream. *Dissolved-solids concentrations* are generally higher during periods of low streamflow, but the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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